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File: USPT

Jul 19, 1983

DOCUMENT-IDENTIFIER: US 4394231 A

TITLE: Cathode for the electrolytic production of hydrogen

Brief Summary Text (13):

According to a preferred embodiment of the invention, the metal oxide of the active zone of the cathode consists of haematite, which is the oxide of trivalent iron, of the general formula  $\text{Fe.sub.2 O.sub.3}$ . This embodiment of the invention is particularly suitable when the cathode is used in the presence of aqueous alkali metal hydroxide solutions, such as the caustic soda solutions and the caustic brines obtained by the electrolysis of sodium chloride brines, respectively in electrolysis cells with a membrane of selective permeability and in electrolysis cells with a permeable diaphragm.

Brief Summary Text (14):

The expression membrane with selective permeability is understood as meaning a thin non-porous separator which separates the anodes from the cathodes and comprises an ion exchange material. Examples of membranes of selective permeability which are suitable for cells for the electrolysis of brine include cationic membranes which contain  $\text{SO.sub.3.sup.-}$  groups and result from the copolymerisation of tetrafluoroethylene and sulphonated perfluorovinyl ether, such as the membranes known under the name NAFION and sold by E. I. du Pont de Nemours and Co.

Brief Summary Text (17):

The thermally decomposable compounds can be used in the solid state, for example in the form of powders, or in the liquid state, for example in the form of molten salts, suspensions or solutions.

Brief Summary Text (27):

To manufacture a cathode according to this preferred embodiment of the invention, it suffices to apply the thermally decomposable compound to the support and then to heat it in a controlled atmosphere in order to decompose it and to crystallise the metal oxide in situ on the support. For this purpose, it is desirable to apply the thermally decomposable compound in the liquid state, preferably in the form of a solution, to the support. Any appropriate coating technique can be used for this purpose, such as immersing the support in a bath of the thermally decomposable compound, painting the support with the said liquid compound or spraying the latter onto the support.

Brief Summary Text (34):

A particularly valuable application of the cathode according to the invention is in cells, with a permeable diaphragm and with a membrane of selective permeability, for the electrolysis of sodium chloride brines, such as the cells described, by way of example, in French Pat. Nos. 2,164,623 of Dec. 12, 1972, 2,223,083 of Mar. 28, 1973, 2,230,411 of Mar. 27, 1974 and 2,248,335 of Oct. 14, 1974, and in French Patent application No. 77/11,370 of Apr. 12, 1977, all in the name of SOLVAY & Cie.

Detailed Description Text (15):

After cleaning in the manner explained in Example 1, the gauze was preheated to 250.degree. C. and then coated immediately with a first layer of the bath by

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immersing it in the latter. The gauze was then heated for 15 minutes in an oven at 250.degree. C., in the presence of air, in order to decompose the ammonium ferritrioxalate and to crystallise a first layer of haematite on the gauze.

Detailed Description Text (29):

The gauze impregnated with a first layer of the bath was then heated for 15 minutes in an oven at 250.degree. C., in the presence of air, so as to decompose the cobalt nitrate and to form a layer of cobalt oxide.